



## A Filtering Cigarette Holder

This application claims the benefit of my Provisional Patent Application No. 60/467892 filed on May 5, 2003, which is hereby incorporated by reference herein.

### BACKGROUND OF THE INVENTION

#### 5 Field of the Invention

The invention pertains to smoking tobacco products such as cigarettes and cigars, more particularly for an apparatus and method for smoking with concomitant reduction in tarry materials inhaled.

#### Description of the Prior Art

- 10 The prior art is replete with examples of various cigarette holders and holders with filters for improving the smoker's experience, in particular reducing the amount of tarry residue that a smoker inhales. It is well known that the tarry components are rich sources of polycyclic aromatic hydrocarbons that are known carcinogens, and that the tars in the cigarette smoke will to some extent condense out in a smoker's lung tissues. While the
- 15 exact contribution of tars to smoking related diseases is unknown, it is certain that many if not most smokers would prefer not to inhale these tars. The use of a cigarette holder with a filter improves the smoking experience.

- Tobacco smoke is a heterogeneous mixture of fixed gasses, condensable vapors, and liquid
- 20 aerosol. Upon cooling and mechanical separation it is possible to separate vapors and aerosol droplets from the fixed gasses. The separated materials contain tars and nicotine from combustion of the tobacco. It is well known in the prior art that separation of droplets and condensable vapors can be effected by combinations of passing the smoke through a restriction to increase its velocity, expanding the smoke against an impingement
- 25 surface, and changing the flow direction. One popular class of cigarette or cigar holder-filter is a multi-part device having one part having a mouthpiece for a user to draw suction on the tobacco product and a second part that fits into the first part, the second part having a means for holding the tobacco product and for processing the smoke by cooling and mechanical processing to remove tars. The instant invention is of this general class of
- 30 cigarette/cigar holder. Other types of device for removing tars include filters that are

integrally attached to the cigarette, and filters that remove components by absorption, adsorption, or chemical reactions.

Qualities by which cigarette holders with filters are evaluated include quality of smoke  
5 treatment, simplicity, cost and ability to clean and reuse.

U.S. Patent No. 3,313,308 to Grasso discloses a Holder for Cigarettes and the Like that has a mouthpiece and a two piece part for holding a cigarette and forming a gas path. The first of the two pieces holds the cigarette and has threads to screw into threads in the  
10 mouthpiece. The second piece has a baffle plate for impingement of the smoke at an end of the first piece between the first piece and second piece for removal of tars, and chamber for accumulation in the annulus between the second piece and the mouthpiece and bounded by the first piece and an o-ring at the front and back. The second piece is attached to the first piece by lugs in the second piece that snap into slots in the first piece.  
15 The two pieces must be unscrewed from the mouthpiece and from each other for cleaning.

U.S. Patent No. 3,926,199 to Thomas discloses a Tobacco Smoke Filter with a special smoke flow path involving two restrictions in series and changes in direction and introduction of ambient air to cool the smoke in such a way as to provide a high usage  
20 time without changing the flow properties.

U. S. Patent 4,038,994 to Aikman is a cigarette holder that contains a filtering element in a cavity within the barrel of the holder. The filter element is provided with a flange that extends from the element and divides the cavity into an upstream filtering chamber and a  
25 downstream storage and filter chamber. The flange permits communication from the upstream to the downstream side of the cavity. Smoke enters the filter cavity through a restriction which imparts high velocity. The device varies the filtration capability by admitting a variable quantity of ambient air.

U.S. Patent 4,049,005 to Hernandez is a filter of the kind that is housed in a cigarette holder which incorporates a restriction into the flow path in which smoke is accelerated. The restriction is followed by an expansion chamber into which ambient air is drawn to accomplish cooling and condensation of tars and nicotine to produce turbulence. As a  
5 consequence, the condensate impinges on the surface of the filter element where it is retained.

U.S. Patent 4,292,983 to Mensik, is a filter cartridge assembly with a filter cartridge which fits into a three piece assembly consisting of a mouth piece, a cigarette holder and a spacer  
10 ring.

U.S. Patent Numbers 3,313,308, 3,926,199, 4,038,994, 4,049,005, and 4,292,983 are hereby incorporated herein by reference.

15 There is a need for a filtering holder for tobacco products such as cigarettes and cigars which removes tars and nicotine from the product, while being easy to use, and clean and reuse.

There is a need for a filtering holder for tobacco products which removes tars and nicotine  
20 from the product while being easy to use, clean and reuse, which filter has a simple and easy to manufacture structure.

#### SUMMARY OF THE INVENTION

It is an object of the invention to provide a filtering holder for use in smoking tobacco  
25 products such as cigarettes and cigars that removes tar and nicotine from tobacco smoke that is easy to use, then clean, and reuse.

It is an object of the invention to provide a filtering holder for use in smoking tobacco products that removes tar and nicotine from tobacco smoke that is easy to use, then  
30 clean, and reuse, and that has a simple and easy to manufacture structure.

It is an object of the invention to provide a filtering holder for use in smoking tobacco products that is an improvement over the state of the art.

5 One aspect of the invention is a filtering holder for tobacco products such as cigarettes or cigars that filters the smoke from combustion of the tobacco to remove tars and nicotine. One preferred embodiment is a cigarette holder. The cigarette holder has two parts, a mouthpiece and a holder. The mouthpiece has a receptacle on one end into which a portion of the holder is removably inserted. The other end of the mouthpiece includes an  
10 outside structure for grasping in a smoker's mouth to draw air through the cigarette holder. Inside of the grasping structure, the mouthpiece defines an outlet chamber for gasses.

The holder comprises a first section disposed at an end of the holder defining an inside  
15 chamber capable of holding the cigarette in place and allowing a volume behind the cigarette for collection of combustion products therein. The first section has an outside surface with a diameter too large to fit into the receptacle in the mouthpiece. The holder further comprises a second section in series with the first section, the second section having an inside and an outside surface. The second section is contoured to fit into the  
20 receptacle in the mouthpiece and defines a continuation of the inside chamber within the second section.

The outside surface of the second section comprises two annular supports protruding outward each for holding a resilient ring and an annular baffle between the two annular  
25 supports. Each of the annular supports has a resilient ring such as an o-ring mounted on it. The outside surface of the second section and the inside surface of the mouthpiece are sized such that the resilient rings fit snugly between the annular supports and the mouthpiece allowing the second section of the holder to be pulled in and out of the mouthpiece while being held firmly in place when the holder is in the mouthpiece. A sealed  
30 chamber is defined between the two supports sealed by the resilient rings. The holder

defines at least one restricted passage from the inside chamber to the sealed chamber, said at least one restricted passage being directed towards the inside surface of the mouthpiece between the two annular supports. The holder further defines an exit passage having at least one inlet between the baffle and the second annular support and an exit into the outlet chamber of the mouthpiece. There is preferably a barrier within the holder such that the only fluid communication between the inside chamber and the outlet chamber is through the sequence of the at least one restricted passage, the sealed chamber and the at least one exit passage. The holder is preferably a piece of molded plastic that is symmetric about a central plane such that any cross section perpendicular to the central plane of symmetry is approximately circular. The at least one restricted passage preferably comprises two diametrically opposed holes through the holder. The at least one exit passage preferably comprises two diametrically opposed holes through the holder.

Another aspect of the invention is a process for smoking an elongate tobacco product, such as a cigarette or a cigar, so as to reduce the amount of tarry materials consumed comprising the acts of:

- a) placing the elongate tobacco product in a receptacle of a holder, a portion of the holder behind the receptacle being removably inserted into a mouthpiece;
- b) lighting the elongate tobacco product and applying suction to the holder through the mouthpiece such that combustion products are drawn through the holder;
- c) passing the combustion products through a restricted passage such that the combustion products accelerate, expand and impinge on a side of the mouthpiece into a single sealed chamber formed in an annular space between the holder and the mouthpiece between two resilient rings each forming a seal between the mouthpiece and the holder;
- d) allowing tarry materials to condense within said sealed chamber; and
- e) drawing the remaining combustion products over a baffle into an outlet passage leading to an exit of the mouthpiece whereto suction is applied.

After tarry materials accumulate in the sealed chamber, the process further comprises:

- 5 f) grasping the portion of the holder extending outside of the mouthpiece in one hand and the mouthpiece in another hand and pulling the holder out of the mouthpiece;
- g) cleaning an outer surface of the holder and an inner surface of the mouthpiece; and
- h) replacing the holder in the mouthpiece.

10 The mouthpiece and holder are preferably smooth molded plastic components so that tarry materials can be readily wiped or washed clean.

Some of distinctive features of the invention as compared to the prior art are:

- 15 1. Two piece construction comprising mouthpiece and holder wherein holder fits into the mouthpiece.
- 2. The holder is removably but snugly retained in place by two resilient "O" rings. The "O" rings retain the holder in place during use, while allowing repeated removal cycles without a complicated mechanism or deterioration in performance.
- 20 3. The symmetry of the holder and the portion of the mouthpiece into which the holder is inserted combine with the O ring construction to make an easy to use article because there is no required orientation of the holder in the mouthpiece.
- 25 4. The tarry droplets are separated by the well known method of accelerating the smoke through a restriction and then impinging on a cooler surface and expanding into some sort of chamber such that the droplets fall out and collect in the chamber. In the prior art this often results in tar collection at several locations and resultant difficulty in cleaning the device after tars accumulate. In the instant article the impingement of the smoke against a surface, expansion, and accumulation of tar all occur within the sealed chamber formed by the "O" rings in the annular space between the mouthpiece and the holder. This allows easy cleaning when the holder is removed from the mouthpiece by
- 30 wiping the outer surface of the holder and wiping or rinsing the inner wall of the

mouthpiece both of which are readily accessible when the holder is separated. The cleaning operation does not require a reaming tool such as a pipe cleaner.

5 BRIEF DESCRIPTION OF THE DRAWINGS

These and other features, aspects and advantages of the present invention will become better understood with regard to the following description, appended claims and accompanying drawings, where:

10 Figure 1 is a perspective view of the mouthpiece in a preferred embodiment cigarette holder of the invention.

Figure 2 is a perspective view of the holder in a preferred embodiment cigarette holder of the invention.

15 Figure 3 is a sectional view drawn through a center plane, of an assembled preferred embodiment

DESCRIPTION

One aspect of the invention is a cigarette or cigar holder of the type that filters out undesirable tarry material from the smoke. A preferred embodiment is a cigarette holder  
20 for use with either filter or non-filter cigarettes. In the application reference is often made to the invention as a cigarette holder or cigarette holder-filter but the invention can always be applied to other types of tobacco products such as cigars, the primary difference being the dimensions.

25 Tobacco smoke is a heterogeneous mixture of fixed gasses, condensable vapors, and liquid aerosol. Upon cooling and mechanical separation it is possible to separate vapors and aerosol droplets from the fixed gasses. The separated materials comprise tars, nicotine and water from combustion of the tobacco. It is well known in the prior art that separation of droplets and condensable vapors can be effected by combinations of passing  
30 the smoke through a restriction to increase its velocity, expanding the smoke against an

impingement surface, and changing the flow direction. The difference between different inventions involves such things as degree of filtration, simplicity of construction, cost, ease of use (particularly cleaning), number of times the holder can be used.

- 5 A preferred embodiment of the invention is a cigarette holder of the type that can be used for a number of cigarettes, about 20, and then cleaned and reused several times, perhaps lasting for a day or two, or several packages of cigarettes.

Referring to the Figures, the cigarette holder has two parts, a mouthpiece 10 and a holder  
10 12. The mouthpiece has a receptacle 14 on one end into which a portion of the holder is inserted. The other end of the mouthpiece includes an outside structure 16 for grasping in a smoker's mouth to draw air through the cigarette holder. Inside of the grasping structure, the mouthpiece defines an outlet chamber 18 for gasses.

- 15 The holder comprises a first section 20 disposed at an end of the holder defining an inside chamber 22 capable of holding the cigarette in place and allowing a volume 24 behind the cigarette with reduced diameter for collection of combustion products therein. The first section 20 has an outside surface with a diameter too large to fit into the receptacle in the mouthpiece. The holder further comprises a second section 26 in series with the first  
20 section, the second section having an inside and an outside surface. The second section is contoured to fit into the receptacle in the mouthpiece and defines a continuation of the inside chamber 28 within the second section.

- The outside surface of the second section comprises a first annular support 30 and a  
25 second annular support 32 protruding outward, each annular support for holding a resilient ring and an annular baffle 38 between the two annular supports. Each of the two annular supports 30 and 32 has a resilient o-ring 34 and 36 mounted on it. The outside surface of the second section and the inside surface of the mouthpiece are sized such that the resilient rings fit snugly between the annular supports and the mouthpiece allowing the  
30 second section of the holder to be pulled in and out of the mouthpiece while being held



firmly in place when the holder is in the mouthpiece. A sealed chamber 40 is defined between the two supports sealed by the resilient rings. The holder defines two restricted passages 42 and 44 from the inside chamber 28 to the sealed chamber 40, the restricted passages are directed towards the inside surface of the mouthpiece 46 between the two  
5 annular supports. The two restricted passages are diametrically opposed holes, with respect to a central plane 50 through the holder. In an alternative embodiment there is only one restricted passage.

The holder further defines an exit passage 52 within having two diametrically opposed  
10 inlets 54 and 56 between the baffle and the second annular support. In alternative embodiments there may be only one inlet. The exit passage 52 leads to outlet chamber 18.

There is preferably a solid barrier 58 between the inside chamber 28 and the exit passage which assures that the only fluid path from the inside chamber to the outlet chamber is  
15 through the at least one restricted passage, the sealed chamber, and the exit passage. The barrier also acts as a spacer between the at least one restricted passage and the at least one inlet to the exit passage preventing condensation of tars in a dead space that would be formed in the inside chamber if there were not a spacer.

The article functions as follows: A cigarette is placed in the inside chamber of the holder and ignited. Air and combustion products are drawn through the cigarette and holder by a user applying suction on the grasping structure of the holder drawing gas through the outlet chamber. The combustion products pass through the at least one restricted passage such that they accelerate due to the restriction. Upon exiting, the combustion products  
25 expand and impinge on a side of the mouthpiece in the sealed chamber formed in the annular space between the holder and the mouthpiece between two resilient rings, and after impinging the combustion products further expands into the sealed chamber. Because of the combined effect of accelerating through the at least one restricted passage, impinging on the relatively cool mouthpiece wall, and re-expanding into the sealed  
30 chamber, a substantial portion of the vapors and droplets which include tarry materials and

nicotine condense and congeal into a brownish-yellow mass within the sealed chamber and onto the inside surface of the mouthpiece and the outside surface of the holder. The remaining gases flow through the at least one inlet to the exit passage and outlet chamber where they are inhaled by the user. The baffle forms a dam which retains the congealed mass from running into the at least one inlet.

The chamber holds enough condensed matter so that a number of cigarettes can be smoked before the holder filter is cleaned. The filter is cleaned by removing the holder from the mouthpiece by grasping one component in each hand and pulling them apart with a twist. The material accumulated on the outer surface of the holder and the inner surface of the mouthpiece can be readily wiped clean or rinsed with water. It is dried and reassembled for reuse by reversing the disassembly procedure. Very little material is condensed in the internal chamber since the combustion products are relatively warm at that point. The high velocity in the at least one restricted passage also keeps it clean of deposits. It is important to note that the surfaces on which congealed tarry materials condense are readily accessible for cleaning when the holder is out of the mouthpiece, and that the cleaning may be accomplished without a tool such as a pipe cleaner or the like.

Preferred materials for the filtering cigarette holder are molded polystyrene plastic for the mouthpiece and Acrylonitrile Butadiene Styrene plastic (ABS) for the holder. A preferred method of manufacture is injection molding for both components, a technique well known to those skilled in the art. The O-rings are slipped onto the annular structures of the formed holder. The o-rings are preferably rubber rings. This preferred set of materials results in a particularly attractive and functional cigarette holder – filter because a polystyrene mouthpiece is transparent and very smooth. Both properties are desirable, since transparency allows a user to monitor when the sealed chamber is getting full and a cleaning is required. The smoothness makes it easy to remove the congealed materials by rinsing the inner surface of the mouthpiece. ABS is desirable for the holder is desirable since it has a rougher surface that is more suitable for holding the cigarette. A smooth surface is not needed for easy cleaning of the holder since it is the outer surface of the

holder on which tarry materials congeal and the surface can be readily wiped clean with a tissue when the holder is removed from the mouthpiece.

5 The fact that there is a single sealed annular chamber where combustion products impinge against a cool surface, change direction, and expand into the large sealed chamber such that the condensed products are substantially all accumulated on the annular surfaces which are easily cleaned is one distinctive feature of the filtering cigarette holder according to the invention. Also note that the holder has symmetry around a central plane so that there is no required angular orientation for the holder. A further distinctive feature is that  
10 the sealed chamber is formed by two o-ring seals which seal the chamber and facilitate easy insertion and withdrawal of the holder from the mouthpiece while maintaining a firm fit without wobble.

A preferred filtering cigarette holder has two restricted passages, the diameter each of the  
15 restricted passages is preferably between about 0.4 and 0.8 mm, most preferably about 0.6 mm. This is an important dimension since the passage through the restricted passage results in an acceleration of combustion gasses which then impinge on the inside surface of the mouthpiece. The diameter of the passage determines the velocity. In general, the determination of what diameter to use is a balance between efficiency of tar removal  
20 (favored by smaller diameter) and pressure drop which results in perceived difficulty in drawing on the cigarette. In contrast the inlet to the exit passage and the exit passage preferably have a large low resistance opening, preferably about 2 mm in diameter. The preferred cigarette holder has a mouthpiece about 46 inches long with a receptacle for inserting the holder which is about 22 mm long and having an inside diameter of about 7.6  
25 mm and an outside diameter of about 11 mm. The distance between the o-rings is about 16 mm and the distance center to center along the axis between a restricted passage and an inlet to the exit passage is about 10 mm. The annular distance between the outer surface of the holder and the inner surface of the mouthpiece in the zone between the restricted passage and the inlet to the exit passage is about 1.3 mm except at the baffle.

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Although the present invention has been described in considerable detail with reference to certain preferred versions thereof, other versions are possible. Therefore the spirit and scope of the appended claims should not be limited to the preferred versions herein.